DOCUMENT RESUME

ED 304 640 CG 021 514

AUTHOR Horgas, Ann L.; And Others
TITLE Attrition in a Large Scale Longitudinal Study of the Elderly: The Role of Health-Status Variables.
SPONS AGENCY Andrus Memorial Foundation, Los Angeles, Calif.
PUB DATE Nov 88
NOTE 32p.; Paper presented at the Annual Meeting of the Gerontological Society (41st, San Francisco, CA, November 18-22, 1988).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Attrition (Research Studies); Comparative Analysis; Death; *Drug Use; *Longitudinal Studies; Mental Health; *Older Adults; *Physical Health; Research Problems; *Well Being

ABSTRACT

In a longitudinal study, subject attrition constitutes a potential threat to the usefulness of data collected from subjects remaining in later waves of the study. If attrition is selective, then the sample at later waves of the study may be representative of a different population than that represented at the outset of the study. This study examined selective attrition between the first three waves of the Medicine, Health, and Aging study, a study which explored the health and psychosocial characteristics of persons enrolled in a state-wide pharmaceutical assistance program for senior citizens in Pennsylvania and compared these characteristics to persons not enrolled in the program. Subjects were 1,803 older adults who were participating in the 3-year study. Every year subjects completed a survey concerning physical and psychological health, functional well-being, and prescription and non-prescription drug use. Analyses focused on comparisons of the characteristics of returning, non-returning, and deceased subjects from wave to wave of the study. The results indicated that attrition and mortality were related to a set of health status, drug use, and functional status characteristics; in general, attrited subjects had experienced lower levels of health and functioning than had returning subjects, and before their death, deceased subjects appeared to have been functioning at levels lower than the non-returning subjects. The findings suggest different processes which may underlie attrition and mortality. Thirteen references, three tables and four figures are included. (Author/NB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED304640

ATTRITION IN A LARGE SCALE LONGITUDINAL STUDY OF THE ELDERLY: THE ROLE OF HEALTH-STATUS VARIABLES

Ann L. Horgas, Michael Marsiske & Frank Ahern

Pennsylvania State University

College of Health and Human Development

University Park, PA 16802

CG 021514

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Running head: **ATTRITION AND HEALTH STATUS**

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Ann L. Horgas

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

This work was conducted under the direction of the Medicine, Health and Aging Study at the Pennsylvania State University. The collection of data reported in this paper was supported in part by a grant from the Pew Medical Trusts, part of the Pew Charitable Trusts of Pennsylvania, and by a grant from the Andrus Foundation.

Abstract

Subject attrition and subject mortality were examined in a study of 1803 senior adults participating in the Medicine, Health and Aging study. The subjects were participants in a 3-year longitudinal study. Every year, for three years, subjects completed a survey which asked questions about physical and psychological health, functional well-being, prescription and non-prescription drug use. Analyses focused on comparisons of the characteristics of returning, non-returning and deceased subjects from wave to wave of the study. The results indicated that attrition and mortality were related to a set of health status, drug use, and functional status characteristics; in general, attrited subjects had experienced lower levels of health and functioning than returning subjects, and deceased subjects appeared to be functioning at levels lower than these non-returning subjects. Discussion focuses on different processes which may underly attrition and mortality.

In a longitudinal study, subject attrition constitutes a potential threat to the usefulness of data collected from subjects remaining in later waves of the study. Longitudinal analysis, by definition, examines the characteristics of those individuals who remain in a study; if attrition is selective (i.e., the group of subjects who drop out of a study have characteristics different from the broader initial sample), then the sample at later waves of a longitudinal study may actually be representative of a different population than that represented at the outset of a study (Atchley, 1969; Baltes, Schaie, & Nardi, 1971; Norris, 1985; Rose, Bosse & Szretter, 1976). The present paper examines selective attrition between the first three waves of the Medicine, Health and Aging (MHA) study. The MHA study examines the health and psycho-social characteristics of persons enrolled in a state-wide pharmaceutical assistance program for senior citizens in Pennsylvania (the Pharmaceutical Assistance Contract for the Elderly, or PACE), and compares these characteristics to persons not enrolled in PACE.

Attrition may be defined as the tendency of subjects in a longitudinal study to drop out from one wave to another. The term selective attrition refers to the general finding that persons who drop out of a study do not do so randomly; in other words,nonresponders may be characterized in certain predictable ways. Attrition, which may include those who cannot be contacted, become too ill to respond, or leave the study due to a lack of desire to participate, must be distinguished from sample mortality. In any longitudinal study of an elderly population, a subset of subjects may be expected to die. It can be argued that if death is preceded by periods of increased physical and psychological

vulnerability, then terminal subjects may also be identified as having certain characteristics. For this reason, the present study particularly emphasizes health and functional status predictors of attrition and death.

Studies of selective attrition

Numerous studies have examined the role of health status and other lifestyle and demographic factors in the prediction of sample attrition from a longitudinal study. Wilson and Webber (1976) , for example, examined attrition in a Florida public health study examining the aged and chronic disease. In examining the characteristics of the non-returning and terminal subjects, the authors reported that the nonresponders and the deceased were more likely to live alone, live in trailers and hotels, were less likely to participate in recreational activities, and were more likely to be disadvantaged in terms of chronic conditions including heart disease, hypertension, gall bladder disease. and cancer.

In a study of retired women, Atchley (1969) noted that, along with certain personality and social characteristics, refusers were more likely report poor health status and lack of sufficient income. Women who refused were also more likely to report infrequent contact with friends and a preference for doing things alone.

In another study of older adults, Norris (1985) assessed selective attrition in a large probability sample. In general, healthier respondents were significantly more likely to remain in the study through all five waves. Regarding the characteristics of drop outs, Norris drew the following broad conclusions. 1) Disinterested subjects tended to

drop out early in the study, and did not greatly bias the remaining sample, since they were not the lowest functioning members of the sample. 2) Subjects who died also did not greatly bias the remaining sample. Death is a natural population characteristic. Thus, death in the sample represents death in the parent population; if the remaining sample functions at a higher level (with low-functioning, deceased subjects eliminated), this would mirror a true increase in function in the parent population. 3) Disabled subjects, who tended to be at the lowest health levels, and who tended to drop out in later waves of the study, were the greatest threats to sample representativity. Disabled subjects left only the sample, and not the parent population. Thus, the increase in the health level of the sample following the departure of disabled subjects did not mirror any population trend.

Studies conducted from a clinical perspective may also inform an understanding of the role of health status variables in sample attrition. In a follow-up mail survey to a five year clinical study of cardiovascular disease in Los Angeles, Reeder (1960) noted significant differences between responders and non-responders in terms of age, race, and socioeconomic status. Although Blacks represented a comparatively small proportion of the original sample, they were significantly more likely to not respond than were the Whites. Among all subjects, a significant linear relationship was noted between age and non-response. Reeder hypothesized that the age/nonresponse relationship was a function of declining functional abilities due to declining health (particularly cardiovascular disease); this relationship was not empirically investigated.

It is interesting to note that the few studies which report little or no effect of attrition on sample characteristics tend to contain atypical samples. As Barton, et al (1980) noted, it is possible to select a sample of homogenous, high functioning subjects, in order to minimize the risk of sample attrition. Unfortunately, this leaves the researcher with a sample which does not include low-functioning subjects, the same danger that emerges with selective subject attrition. Those studies that report a minimal selective attrition effect (eg. Goudy, 1976, Goudy, 1985, and Norris, 1987) all report relatively homogenous and high-functioning samples.

Studies of sample mortality

In a study of subject mortality, Powers & Bultena (1972) found that subjects in a longitudinal study lost to death were more likely to be older, to report having a lower income and a greater number of health problems. Further, subjects who died were more likely to be widowed or confined to home. Those who died did not differ from respondents in level of life satisfaction, self-assessed health status, or general attitudes about life.

Work by Riegel, Riegel, & Meyer, (1967), and Riegel & Riegel (1972) also supports the notion that better functioning subjects are more likely to remain in longitudinal studies. Variables with significant relationships to mortality were found, but these relationships held most strongly for younger subject groups. In general, subjects who dropped out their studies were more likely to drop out due to serious illness. Physical inactivity was the single best predictor of death.

In summary, the emerging picture of attrition in longitudinal samples is one of a loss of the lowest functioning performers. Consequently, any longitudinal study of elderly subjects may not provide an accurate picture of developmental changes. The present study sought to replicate existing findings concerning attrition and death in a longitudinal study of elderly subjects. By examining differences between stable and departing participants, particularly on health-status and drug use variables, the present study sought to chart changes in a sample as a function of selective subject loss.

The purpose of this paper, congruent with the existing literature, is to examine four main issues: 1) What are the health status, drug use, and demographic characteristics of non-returning subjects? Health status variables were selected for analysis because they were thought to be particularly salient indicators of functional abilities (including the ability to participate in a longitudinal study). 2) What are the characteristics of subjects who died between successive times of measurement? 3) How do attrited and deceased subjects differ from one another? 4) Does a sample become progressively more selected at each successive wave of a longitudinal study? If so, different characteristics may describe returning and non-returning subjects at each wave of a study. The present study sought to investigate the precise nature of these differences.

Methods

Subjects

A total of 1,803 Pennsylvania residents over the age of 65 were randomly selected to participate in a longitudinal study of the elderly. A stratified random sample was selected to assure representation of both participants and nonparticipants in the Pennsylvania Pharmaceutical Assistance Contract for the Elderly Program (PACE). PACE-enrolled subjects were randomly selected from among all PACE cardholders. A sample of 3,700 names, addresses, and phone numbers were generated from a file of all approved PACE cardholders as of August 1, 1985. Non-PACE enrolled participants were selected through a Random Digit Dialing (RDD) procedure. Households were screened for residents 65 years of age and older and not enrolled in PACE. Subjects were interviewed via telephone for approximately 10 minutes on a number of health, prescription drug use, and functional status domains and then asked to participate in longitudinal follow-up mail surveys. Table 1 proves a partial demographic profile of study participants in returning, non-returning, and deceased groups.

Insert Table 1 about here

Figure 1 illustrates the flow of subjects into and out of the subject pool in the course of the first three waves of the study.

Insert Figure 1 about here

Procedures

Longitudinal survey data, including questions about a subject's demographic characteristics, functional status and well-being, prescription and non-prescription drug use, physical/psychological health, and medical service use were used for the present analyses

Longitudinal data was collected via mail surveys administered on a yearly basis from 1985 to 1987. A mail questionnaire, cover letter, and return envelope were sent to those subjects who completed the phone interview and for whom a name and address for follow-up was known (n=1,705). In order to maximize response rates, a postcard reminder was sent within ten days of the initial mailing; a second mailing with a new questionnaire sent by the third week; and, a second postcard reminder was sent within 10 days of the second mailing. After Wave One of the mail survey, "key informants", ie. persons likely to know the residential status of the participants at future survey points were identified to facilitate tracking of subjects for future waves of data collection, The key informants allowed the participants to be traced as they moved to another private residence, long-term care facility, or died.

The same mail survey procedures were then followed at Wave Two in Fall 1986 and Wave Three in Fall 1987.

Results

Comparison of Wave One subject characteristics by Wave Two subject status

Table 2 provides a profile of subjects in returning, non-returning and deceased groups with respect to their Wave One characteristics. Refer to Table 2 for elaboration of the findings discussed below.

Insert Table 2 about here

Wave One to Wave Two attrition.

1. Demographic characteristics. Persons who dropped out of the study before the second wave were more likely to be non-white (X^2=8.73, df=2, p <.01) and of lower reported income (X^2=15.72, df=6, p<.02). Refer to Table 1 for a demographic profile of subjects.

2. Self reported drug use. Non-responders were more likely to report not using thyroid medications than responders (X^2=7.24, df=2, p <.03.) Figure 2 compares returning, non-returning, and deceased subjects on Time One and Time Two drug use, as reflected by the total number of medications used.

Insert Figure 2 about here

---

3. Functional status. At Time One, non-returning subjects reported greater difficulty than returning subjects with preparing meals (X^2=10.14, df=1, p <.0015) and shopping (X^2=4.55, df=1, p <.03). Figure 3 illustrates Wave One and Wave Two meal preparation abilities of returning, non-returning and deceased subjects, as an indicator of group differences in functional status.

Insert Figure 3 about here

---

4. Physical/psychological health and medicine service use. Nonresponders were more likely than returning subjects, based on Wave One data, to report seeing a doctor never or greater than 6 times in the past six months (X^2=9.54, df=3, p<.02). They also reported having fewer prescribers in the past six months (X^2=9.57, df=3, p <.03). Figure 4 illustrates self-rated health of returning, non-returning and deceased subjects at Waves Two and Wave Three, as an indicator of group differences in health status at Waves One and Two.

Insert Figure 4 about here

Wave One to Wave Two Mortality.

1. Demographic characteristics. Subjects who died by Wave Two were more likely than returning subjects to be male (X^2=9.28, df=1, p <.002) and between the ages of 75 to 84 years of age. Returning subjects were more likely to be between 65 and 69 years of age (X^2=12.69, df=4, p <.01). Please see Table 1 for sample demographic profiles of the different subject groups.

2. Self-reported drug use. Prior to death, at the Wave One survey, deceased subjects reported taking more medicines (X^2=30.59, df=10, p <.0007), and more prescription medications (X^2=31.06, df=10, p <.0006). Subjects who died reported taking significantly more of the following medications than returning subjects: pain medicine (X^2=7.38, df=2, p <.025), heart medications (X^2=37.42, df=4,p <.0001), anticoagulants (X^2=30.17, df=3, p <.0001) and ulcer medications (X^2=11.79, df=2, p <.003). Refer to Figure 2 for a profile of group differences in drug use.

3. Functional status. At Time One, deceased subjects were more likely than returning subjects to report difficulties with activities of daily living such as preparing meals (X^2=10.92, df=1, p <.001), shopping (X^2=13.46, df=1, p <.0002), heavy housework (X^2=4.33, df=1, p <.04), climbing stairs (X^2=4.66, df=1, p <.03), and dressing (X^2=8.81, df=1, p <.003). Subjects who died were also more likely to report having help taking medication (X^2=4.65, df=1, p <.03). Figure 3 illustrates group differences in meal preparation ability at Waves One and Two.

4. Physical/psychological health and medical service use. Compared to subjects who returned to the study at Wave Two, subjects who died

prior to the second time of measurement were more likely to rate their mental/emotional health as only fair or poor (X^2=23.75, df=3, p <.0001). Deceased subjects were also much more likely to rate their present health as only fair or poor (X^2=65.60, df=3, p <.0001) and to suffer from a range of ailments including severe circulatory problems (X^2=23.87, df=3, p <.0001), cancer (X^2=76.33, df=3, p <.0001, visual problems (X^2=15.77, df=3, p <.001), heart trouble (X^2=48.63, df=3, p <.0001), diabetes (X^2=23.33, df=3, p <.0001) and bronchitis/emphysema (X^2=8.47, df=3, p <.0001). People who died also tended to report having seen a doctor more often in the 6 months prior to Wave One (X^2=14.62, df=3, p <.002) than those who remained in the study. In addition, they reported having more prescribers (X^2=10.13, df=3, p <.02) and to have spent more than a week in the hospital (X^2=7.31, df=2, p <.03). Figure 4 illustrates group differences in self-rated health at Waves One and Two.

Wave One to Wave Two attrition and mortality.

1. Demographic characteristics. Subjects who died had a higher proportion of males (X^2=11.34, df=1, p <.0008) and reported higher income levels (X^2=16.12, df=6, p <.01) than subjects who dropped out of the study.

2. Self-reported drug use. Deceased subjects reported using a greater number of medicines overall than attrited subjects at Time One (X^2=27.48, df=8, p <.0006) as well as using more prescription drugs (X^2=28.98, df=8,p <.0003). Compared to non-returning subjects, those who died prior to Wave Two reported using more pain medication (X^2=10.07, df=3, p <.018), diuretics (X^2=8.45, df=2, p <.01), heart medication (X^2=11.85, df=4, p <.0185), anticoagulants (X^2=18.86, df=3, p <.0003),

ulcer medications (X^2=6.81, df=1,p <.009), and seizure medications (X^2=7.51, df=1, p <.006). See Figure 2.

3. Functional status. No significant differences were noted between subjects who died and those who dropped out of the study.

4. Physical/psychological health and medical service use. Deceased subjects were much more likely to rate their health as only fair or poor when compared to non-responders (X^2=24.75, df=3, p <.0001). Subjects who died reported a higher incidence at Time One of circulatory problems (X^2=20.20, df=3, p <.0002), asthma (X^2=8.75, df=3, p <.03), cancer/leukemia (X^2=28.26, df=3, p <.0001), hearing problems (X^2=9.25, df=3, p <.03), heart trouble (X^2= 18.11, df=3, p <.0004), urinary tract disorders (X^2=7.83, df=3, p <.05), diabetes (X^2=14.56, df=3, p <.002) and bronchitis/emphysema (X^2=16.13, df=3, p <.001). Subjects who died also tended to report visiting a doctor more frequently in the six months prior to Wave One data collection (X^2=a22.63, df=3, p <.0001). See Figure 4.

Comparison of Wave Two subject characteristics by Wave Three subject status

Table 3 provides a profile of subjects in returning, non-returning and deceased groups with respect to their Wave Two characteristics. Refer to Table 3 for elaboration of the findings discussed below.

Insert Table 3 about here

Wave Two to Wave Three attrition.

1. Demographic characteristics. Persons who dropped out of the study before the third wave were more likely than returning subjects to report lower levels of education X^2=18.76, df=3, p <.0003), and to be non-white (X^2=24.96, df=2, p <.0001).

2. Self-reported drug use. Non-returning subjects at Wave Three were less likely than returning subjects to report, at Wave Two, taking vitamin supplements (X^2=11.45, df=4, p <.02) but more likely to report using insulin injections (X^2=10.75, df=2, p <.005). Figure 2 illustrates group differences in drug usage.

3. Functional status. At Time Two, persons who did not return to the study at Wave Three were more likely than their returning counterparts to report difficulty in a variety of functions including managing finances (X^2=17.28, df=2, p <.0002), preparing meals (X^2=21.95, df=2, p <..0001), obtaining transportation (X^2=25.45, df=2, p <.0001), shopping (X^2=15.16, df=2, p <.0005), and doing heavy housework (X^2=19.75, df=2, p <.0001). They were also more likely to report difficulty with such personal care activities as cutting toenails (X^2=9.01, df=2, p <.01), washing/bathing (X^2=11.31, df=2, p <.004) and dressing (X^2=6.44, df=2, p <.04). Figure 3 indicates group differences in meal preparation

4. Physical/ psychological health and medical service use. attrited subjects tended to report lower levels of perceived health (X^2=18.52, df=3, p <.0003). They reported a higher incidence of cancer/leukemia (X^2=9.14, df=3, p <.03) and diabetes (X^2=11.67, df=3, p <.009). Non-returning subjects were much more likely to report seeing a doctor six or more times in the past six months (X^2=411.83, df=3,

p<.0001). They were also much more likely to report having three or more medicine prescribers (X^2=509.80, df=3, p <.0001). Attrited subjects were also much more likely to report having spent 8 or more days hospitalized in the six months prior to Wave Two (X^2=525.57, df=2, p <.0001). Figure 4 illustrates group differences in self-rated health.

Wave Two to Wave Three Mortality.

1. Demographic characteristics. Deceased subjects were more likely to be male (X^2=14.46, df=1, p <.001) and older than returning subjects (X^2=30.17, df=4, p <.0001).

2. Self-reported drug use. Returning subjects were more likely than those who dropped out to report using fewer diuretics (X^2=6.43, df=2, p <.04), less insulin injections (X^2=16.80, df=2, p <.0002).

3. Functional status. At Time One, subjects who later died between the second and third wave of the study were significantly more likely to report more difficulty managing finances (X^2=8.95, df=2, p <.01), preparing meals (X^2=11.55, df=2, p <.003), managing transportation (X^2=11.41, df=2, p <.003), shopping (X^2=15.23, df=2, p <.005), and doing heavy housework (X^2=14.03, df=2, p <.01). They also reported more trouble climbing stairs (X^2=8.90, df=2, p <.01), washing and bathing (X^2=19.28, df=2, p <.01), and dressing (X^2=12.23, df=2, p <.002).

4. Physical/psychological health and medical service use. Subjects who died between Waves Two and Three were more likely than returning subjects to rate their own health as fair or poor at Wave Two (X^2=8.84, df=3, p <.03).Deceased subjects were noted to have a higher

incidence of cancer/leukemia (X^2=29.17, df=3, p <.0001), heart problems (X^2=13.93, df=3, p <.003), diabetes (X^2=16.62, df=3, p <.0008). Compared to returning subjects, those who died between times of measurement visited a doctor more often (X^2=147.31, df=3,p <.0001), had more prescribers (X^2=182,90, df=3, p <.0001), and were more likely to have spent a week or more in the hospital during the six months prior to Wave Two data collection (X^2=229.55, df=2, p <.0001).

Wave Two to Wave Three attrition and mortality.

1. Demographic characteristics. No significant differences were noted.

2. Self-reported drug use. No significant differences were noted between deceased and attrited subjects on these variables.

3. Functional status. Subjects who died between Wave Two and Wave Three reported more difficulty at Time Two than attrited subjects with washing and bathing (X^2=6.17, df=2, p <.05).

4. Physical/psychological health and medical service use. Deceased subjects reported a higher incidence of heart trouble at Time Two than non=returning subjects (X^2=8.67, df=3, p <.03).

Discussion and Conclusions

The present study sought to compare the characteristics of non-returning and deceased subjects to those of returning subjects in a longitudinal survey. Four main issues were examined.

1. **Characteristics of non-returning subjects.** The results of comparisons between returning and non-returning subjects from Wave One to Wave Two suggested that, generally, attrited subjects reported being in poorer health, and having greater difficulties with activities of daily living. This finding holds for attrition from Wave Two to Wave Three also. However, subjects who dropped out in later waves tended to report a higher usage of medical services and drugs, and reported themselves as sicker than those who dropped out after Time One.

2. **Characteristics of deceased subjects**. When the characteristics of deceased subjects were compared to those of returning subjects from Wave One to Wave Two, deceased subjects had reported significantly more drug use, poorer health, increased service use, and some difficulty with the activities of daily living. This held for subjects who died between Waves Two and Three.

3. **Comparison of deceased and non-returning subjects**. In general, in the earlier waves of the study, subjects who died had tended to be sicker, and reported greater drug use at Time One, than subjects who did not return to the study for other reasons. Conversely subjects who died between the second and third waves showed few differences from subjects

who dropped out. However, both groups were generally lower functioning than returning subjects throughout all waves of the study.

4. **Discontinuous patterns of attrition and death.** There were few differences in the characteristics of subjects who died between Wave One and Two and those who died between the second and third waves. Conversely, attrited subjects who dropped out after wave Two tended to be sicker and lower functioning than those who dropped out earlier. As a result, it can be argued that a different constellation of descriptors characterizes attrited subjects at each wave of the study. Put simply, people who drop out earlier in a study may drop out for different reasons than people who drop out later. Two implications follow: First, not only may attrition alter the characteristics of a sample such that it represents a different population from one wave to the next, but this may be an ongoing process. At each wave, a very different population may be represented. This suggests that conclusions made at earlier waves of the Medicine, Health and Aging Study may not be generalizable to later waves. Second, following Norris (1985), the attrited subjects may constitute a real threat to a longitudinal study, more so than terminal subjects due to the fact that mortality is a naturally occurring phenomenon. Thus, sample mortality mirrors true population mortality. Conversely, lower functioning individuals who do not die remain in a population, but not in a study. Consequently the sudden loss (after one or two waves) of the lowest functioning subjects means there is a growing discontinuity between the sample and its population with higher functioning subjects remaining.

It is interesting to speculate on 1) the greater continuity of characteristics of deceased subjects (as opposed to attrited subjects) between waves, and 2) the decreasing discrepancy between deceased and attrited subjects at successive waves of the study. It may be that attrition is related to a higher number of psychosocial and functional factors, while death is more attributable to biological factors. As would be expected, subjects who died were sicker, took more drugs, used more medical services, and had greater difficulty functioning on a daily basis than subjects who remained in the study as well as those who dropped out.. These factors did not vary greatly between waves of the study; they remained stable characteristics of deceased subjects. However, when deceased subjects were compared to attrited subjects at later waves of the study fewer differences were noted, perhaps explainable by the fact that more compromised subjects dropped out earlier in the study.

References

Atchley, R. E. (1969). Respondents vs. refusers in an interview study of retired women: An analysis of selected characteristics. Journal of Gerontology, 24, 42-47.

Baltes, P. B., Schaie, K. W., & Nardi, A. H. (1971). Age and experimental mortality in a seven-year longitudinal study of cognitive behavior. Developmental Psychology, 5, 18-26.

Barton, J., Bain, C., Hennekens, C., Rosner, B., Belanger, C., Roth, A., & Speizer, F. E. (1980). Characteristics of respondents and nonrespondents to a mailed questionnaire. American Journal of Public Health, 70, 823-825.

Goudy, W. J. (1976). Nonresponse effects on relationships between variables. Public Opinion Quarterly, 40, 360-369.

Goudy, W. J. (1985a). Effects of sample attrition and data analysis in the Retirement History Study. Experimental Aging Research, 11, 161-167.

Goudy, W. J. (1985b). Sample attrition and multivariate analysis in the Retirement History Study. Journal of Gerontology, 40, 358-367.

Norris, F. H. (1985). Characteristics of older nonrespondents over 5 waves of a panel study. Journal of Gerontology, 40, 627-636.

Norris, F. H. (1987). Effects of attrition on relationships between variables in surveys of older adults. Journal of Gerontology, 42, 597-605.

Powers, E. A., & Bultena, G. L. (1972). Characteristics of deceased dropouts in longitudinal research. Journal of Gerontology, 27, 530-535.

Reeder, L. G. (1960). Mailed questionnaires in longitudinal health studies: The problem of maintaining and maximizing response. Journal of Health and Human Behavior, 1, 123-129.

Riegel, K. F., & Riegel, R. M. (1972). Development, drop, and death. Developmental Psychology, 6, 306-319.

Riegel, K. F., Riegel, R. M., & Meyer, G. (1967). A study of the dropout rates in longitudinal research on aging and the prediction of death. Journal of Personality and Social Psychology, 5, 342-348.

Rose, C. L., Bosse, R., & Szretter, W. T. (1976). Relationship of scientific objectives to population selection and attrition in longitudinal studies: Case of normative aging study. Gerontologist, 16, 508-516.

Acknowledgements

The results reported here were made possible by the efforts of a group of investigators (M. Smyer, F. Ahern, and D. Lago) at the Pennsylvania State University in collaboration with the Pennsylvania Department of Aging (Linda Rhodes, Secretary; and T. Snedden, Director, Bureau of Pharmaceutical Assistance [PACE]), supported by the Medical Trust, one of the PEW Charitable Trusts of Philadelphia and by the AARP Andrus Foundation. The co-investigators wish to acknowledge with great appreciation: The PACE-R Project team members (S. Miller, G. Berry, J. Bodnar, M. Diehl, J. Tubman, S. Malone, T. Lair, P. Hallberg, and V. Rabatin; the staff of the PACE program (A. Darlington and J. DuChane); and the staff of the Computer Company, the PACE Contractor (D. Suders and K. Peters); and our consultants (P. Lamy, University of Maryland at Baltimore, W. Ray, Vanderbilt University, J. Roberts, The Medical College of Pennsylvania, and W. Simonson, Oregon State University).

Ann L. Horgas

Michael Marsiske

Department of Individual and Family Studies

Frank Ahern

Department of Health Policy and Administration

College of Health and Human Development, The Pennsylvania State University, University Park, PA 16802

Table 1

Demographic characteristics of returning, non-returning, and deceased subjects at Wave One and Two

	Wave 2 follow-up			Wave 3 follow-up		
	Returning	Non-Returning	Deceased	Returning	Non-Returning	Deceased
N	1301	442	51	1175	527	96
Education completed						
% grade school	31.5	38.0	39.6	30.9	38.3	36.3
% post-second.	16.7	13.9	20.8	17.5	13.3	15.6
Gender						
% Male	29.9	27.1	51.0	29.7	26.8	49.0
Ethnicity						
% White	94.7	91.0	98.0	95.7	89.4	96.9
Age						
% 65-69	37.8	32.5	21.6	37.4	36.1	18.8
% 70-74	30.3	32.5	29.4	31.8	29.0	27.1
% 75-79	19.6	19.0	23.5	19.1	19.4	26.0
% 80-84	8.7	10.5	21.6	8.5	10.2	20.8
% 85+	3.6	5.5	3.9	3.2	5.4	3.2
Employment						
% Working	8.4	7.9	5.9	7.0	5.2	4.5
Marital status						
% Married	40.6	36.7	49.0	39.5	34.2	31.8
% Widowed	49.4	50.5	37.3	50.7	55.1	50.0
% Div/Sep	4.2	7.0	5.9	2.4	5.7	9.1
% Never married	5.9	5.9	7.8	6.4	5.1	9.1
Income						
% $5000-$12000	77.9	78.4	68.3	73.1	77.9	91.0
% $12000 +	22.1	21.6	31.7	26.9	22.1	9.0

Table 2

Comparison of selected Wave One characteristics of returning, non-returning, and deceased subjects at Wave Two

Domain and Variable	Returning	Non Returning	Deceased
Drug Use			
% using 1 or more:			
medications	80.1	73.6	88.4
prescription medications	80.0	73.6	98.1
thyroid medications	6.0	4.2	7.0
pain medications	11.9	11.6	25.6
seizure medications	5.6	1.9	11.6
heart medications	24.2	26.4	44.2
anticoagulant medications	8.0	4.6	19.6
ulcer medications	8.4	8.3	23.3
diuretics	24.2	21.8	41.9
Functional status			
% having difficulty with:			
preparing meals	5.5	10.0	17.6
shopping	13.8	18.2	33.3
heavy housework	33.9	34.9	49.0
climb stairs	31.6	31.9	47.1
dressing	8.5	8.4	21.6
Physical/psychological health			
In the six months prior to survey, % with:			
1 or more doctor visits	81.1	78.7	88.2
1 or more prescribers	61.7	55.1	66.1
1 or more days in hospital	14.0	14.4	24.0
% reporting fair/poor psychol. health	15.4	14.2	25.6
% reporting fair/poor physical health	38.8	43.2	65.0
% free of :			
cancer/leukemia	95.7	99.1	85.1
circulatory problems	69.2	74.4	43.9
visual problems	65.8	63.8	53.7
heart problems	71.8	67.8	48.8
diabetes	85.8	85.2	68.3
bronchitis/emphysema	86.5	92.9	73.2
asthma	92.9	94.8	87.8
hearing	68.9	75.7	68.3
urinary tract disorders	84.3	89.1	80.5

Table 3

Comparison of selected Wave Two characteristics of returning, non-returning, and deceased subjects at Wave Three

Domain and Variable	Returning	Non Returning	Deceased
Drug Use			
% using 1 or more:			
medications	84.5	82.0	95.5
prescription medications	83.1	80.8	95.5
injected insulin	2.9	7.8	18.2
diuretics	23.8	29.7	45.5
Functional status			
% having difficulty with:			
preparing meals	17.1	31.2	45.0
shopping	26.0	36.9	60.0
heavy housework	62.0	65.8	80.0
climb stairs	48.7	56.3	80.0
dressing	16.9	24.0	47.4
washing/bathing	17.8	29.2	55.0
obtaining transportation	22.9	40.7	50.0
cutting toenails	43.4	47.1	66.7
Physical/psychological health			
In the six months prior to survey % with:			
6 or more doctor visits	25.5	78.0	84.4
3 or more prescribers	18.1	74.8	78.1
8 or more days in hospital	16.9	74.0	83.3
% reporting fair/poor phys. health	43.9	61.7	76.2
% free of :			
cancer/leukemia	96.9	94.1	88.9
heart problems	85.4	76.7	63.2
diabetes	69.5	60.9	42.1

Figure Captions

Figure 1. Subject pool entrances and exits, Wave One telephone survey to Wave Three

Figure 2. Comparison of the total number of medications used by returning, non-returning and deceased subjects at Waves One and Two

Figure 3. Comparison of self-reported meal preparation ability of returning, non-returning and deceased subjects at Waves One and Two

Figure 4. Comparison of self-reported physical health of returning, non-returning and deceased subjects at Waves One and Two

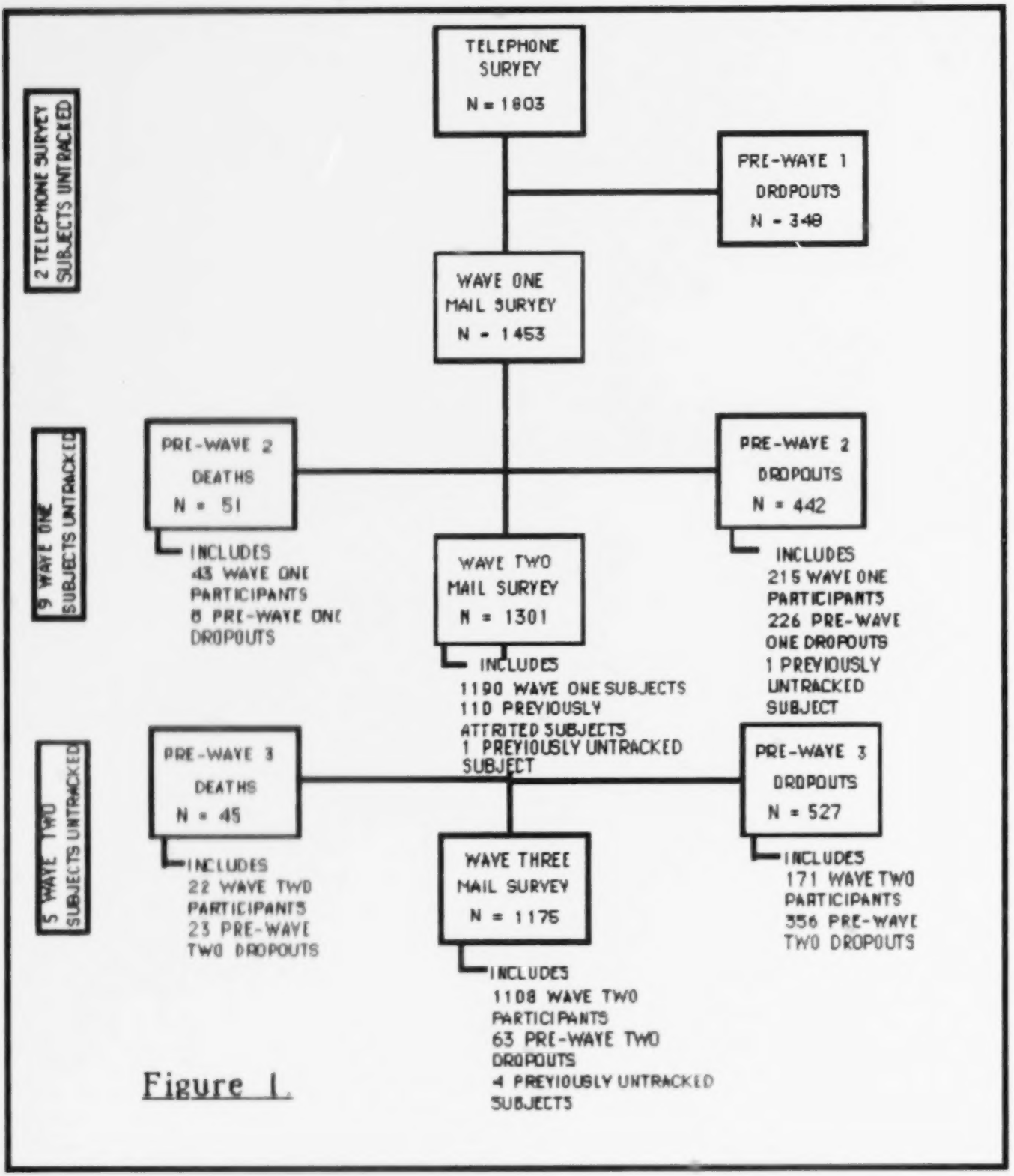
TELEPHONE SURVEY
N = 1803
PRE-WAVE 1 DROPOUTS
N = 348
2 TELEPHONE SURVEY SUBJECTS UNTRACKED
WAVE ONE MAIL SURVEY
N = 1453
PRE-WAVE 2 DEATHS
N = 51
INCLUDES 43 WAVE ONE PARTICIPANTS 8 PRE-WAVE ONE DROPOUTS
PRE-WAVE 2 DROPOUTS
N = 442
INCLUDES 215 WAVE ONE PARTICIPANTS 226 PRE-WAVE ONE DROPOUTS 1 PREVIOUSLY UNTRACKED SUBJECT
9 WAVE ONE SUBJECTS UNTRACKED
WAVE TWO MAIL SURVEY
N = 1301
INCLUDES 1190 WAVE ONE SUBJECTS 110 PREVIOUSLY ATTRITED SUBJECTS 1 PREVIOUSLY UNTRACKED SUBJECT
PRE-WAVE 3 DEATHS
N = 45
INCLUDES 22 WAVE TWO PARTICIPANTS 23 PRE-WAVE TWO DROPOUTS
PRE-WAVE 3 DROPOUTS
N = 527
INCLUDES 171 WAVE TWO PARTICIPANTS 356 PRE-WAVE TWO DROPOUTS
5 WAVE TWO SUBJECTS UNTRACKED
WAVE THREE MAIL SURVEY
N = 1175
INCLUDES 1108 WAVE TWO PARTICIPANTS 63 PRE-WAVE TWO DROPOUTS 4 PREVIOUSLY UNTRACKED SUBJECTS

Figure 1.

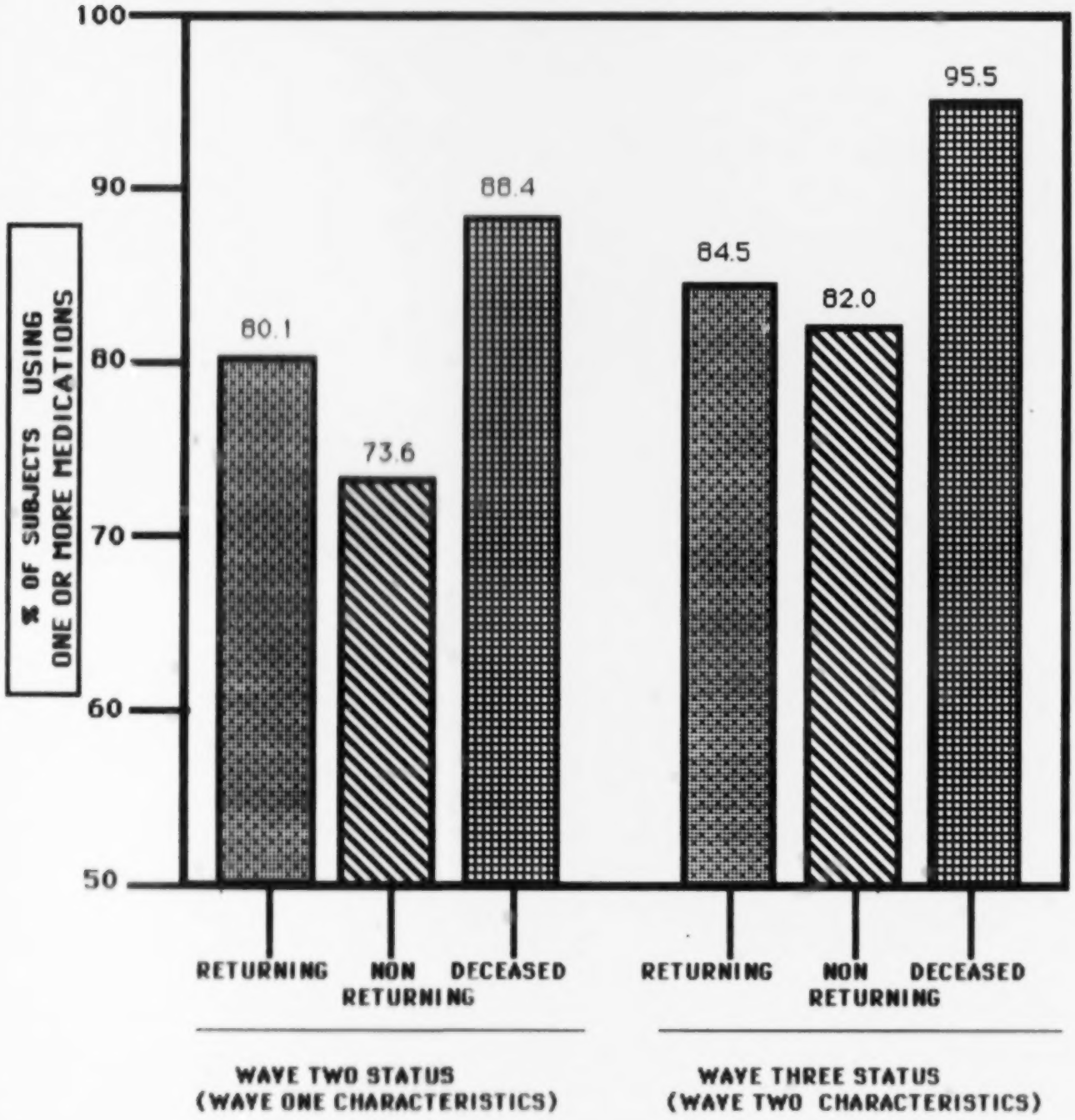
100
90
80
70
60
50
% OF SUBJECTS USING ONE OR MORE MEDICATIONS
80.1
73.6
88.4
84.5
82.0
95.5
RETURNING
NON RETURNING
DECEASED
RETURNING
NON RETURNING
DECEASED
WAVE TWO STATUS (WAVE ONE CHARACTERISTICS)
WAVE THREE STATUS (WAVE TWO CHARACTERISTICS)

Figure 2

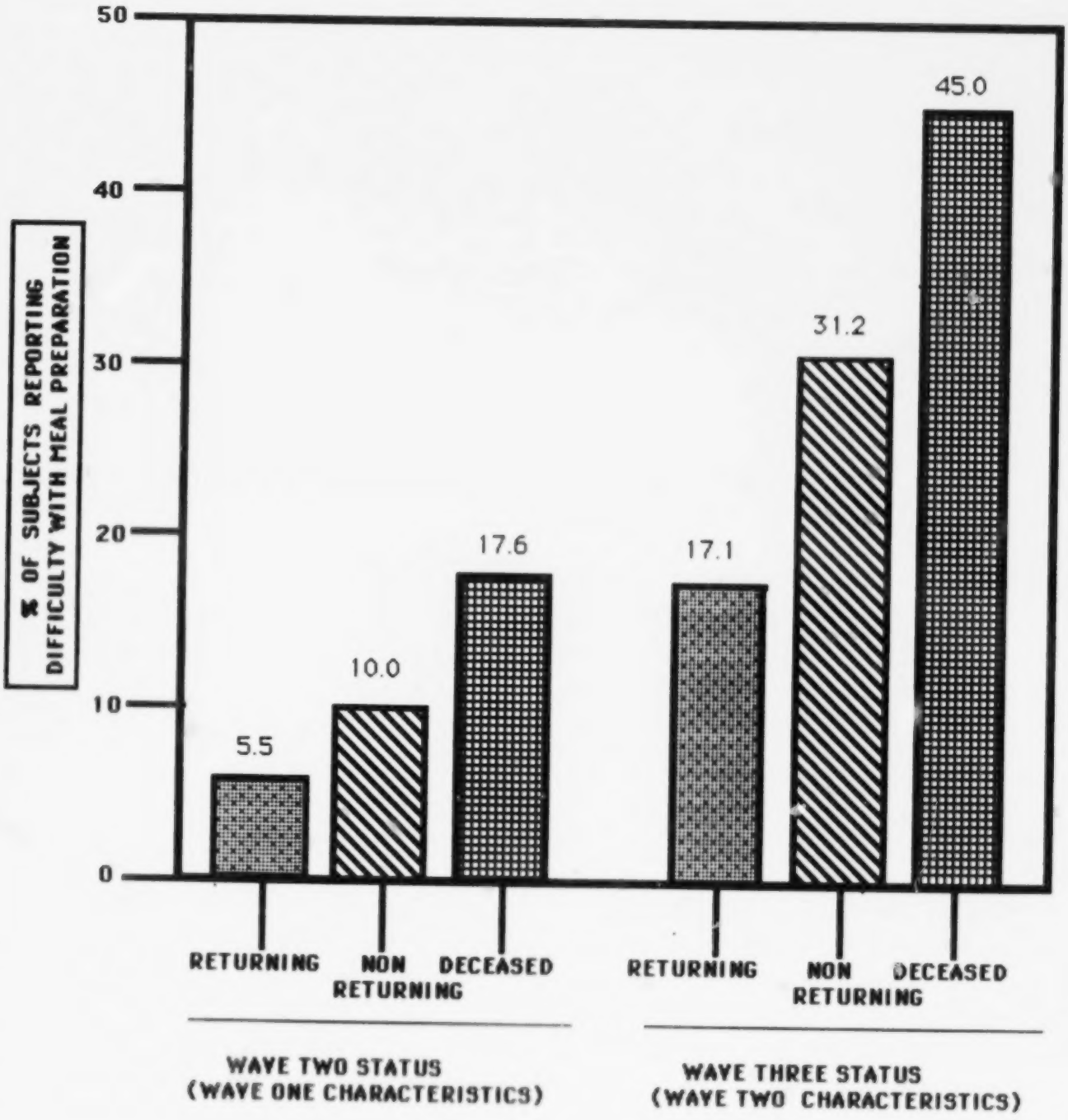
50
40
30
20
10
0
% OF SUBJECTS REPORTING DIFFICULTY WITH MEAL PREPARATION
5.5
10.0
17.6
17.1
31.2
45.0
RETURNING
NON RETURNING
DECEASED
RETURNING
NON RETURNING
DECEASED
WAVE TWO STATUS (WAVE ONE CHARACTERISTICS)
WAVE THREE STATUS (WAVE TWO CHARACTERISTICS)

Figure 3

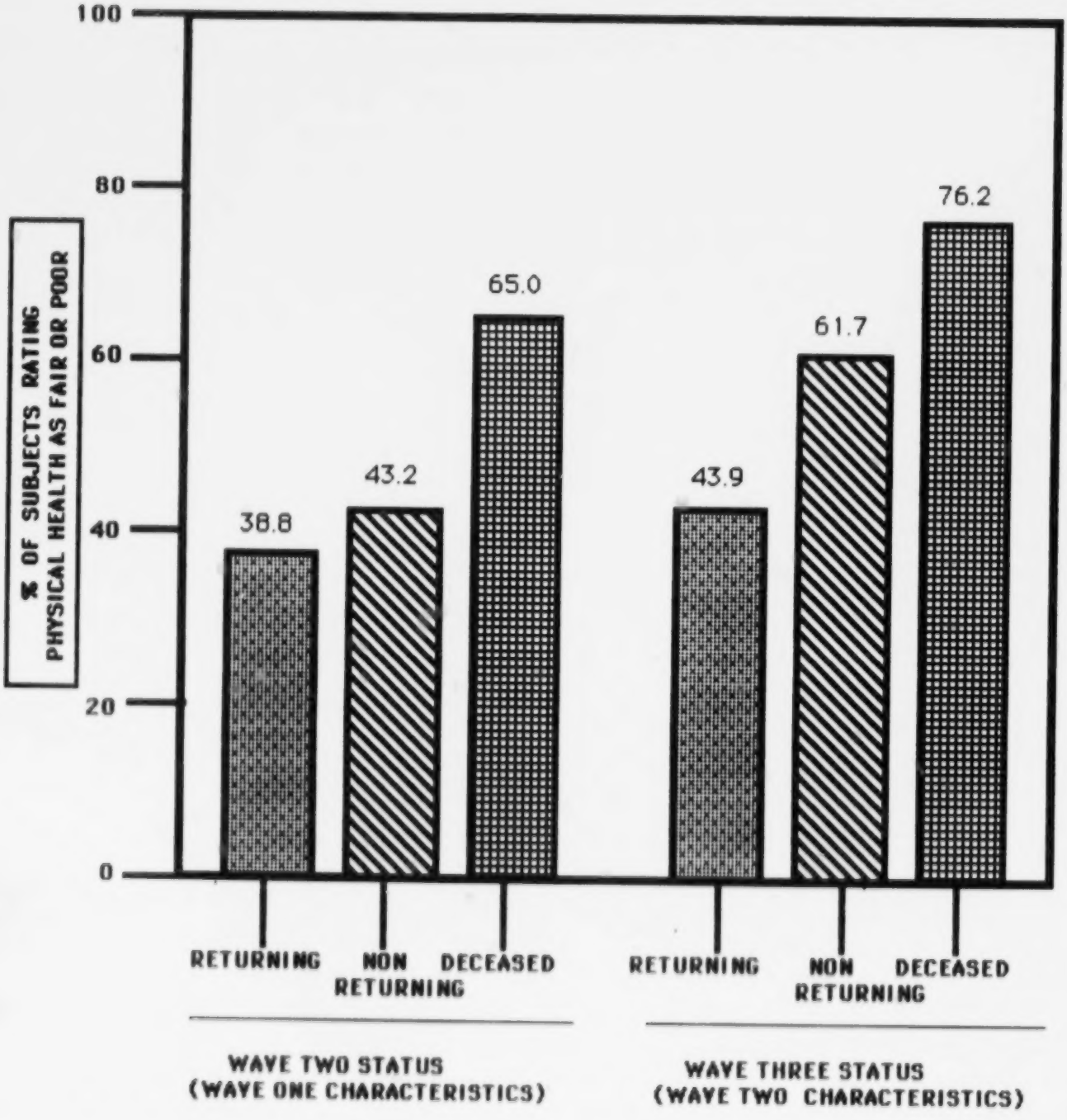
100
80
60
40
20
0
% OF SUBJECTS RATING PHYSICAL HEALTH AS FAIR OR POOR
38.8
43.2
65.0
43.9
61.7
76.2
RETURNING
NON RETURNING
DECEASED
RETURNING
NON RETURNING
DECEASED
WAVE TWO STATUS (WAVE ONE CHARACTERISTICS)
WAVE THREE STATUS (WAVE TWO CHARACTERISTICS)

Figure 4